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A Code of Practice for Video Display Terminals

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A Code of Practice For Video Display Terminals

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Legislative authority

The Occupational Health and Safety Act, 1993 and *The Occupational Health and Safety Regulations, 1996* apply to all workplaces under provincial jurisdiction.

This code of practice is issued pursuant to the legislative authority contained in section 45 of *The Occupational Health and Safety Act, 1993*. Section 45 states:

Codes of practice

"**45**(1) For the purpose of providing practical guidance with respect to the requirements of any provision of the regulations, the director may, after any consultation with interested persons or associations that the director considers advisable:

(a) issue codes of practice;

(b) amend or repeal any code of practice issued pursuant to clause (a).

(2) Where a code of practice is issued, amended or repealed, the director shall publish a notice in *The Saskatchewan Gazette* identifying the code of practice, specifying the provisions of the regulations to which it relates and stating the effective date of the code of practice, amendment or repeal.

(3) The failure by a person to observe any provision of a code of practice is not of itself an offence.

(4) Where a person is charged with a breach of a regulation with respect to which the director has issued a code of practice, the code of practice is admissible as evidence in a prosecution for the violation of the regulation.

(5) A copy of the code of practice or an amendment to a code of practice that is certified to be a true copy by the director shall be received in evidence in any court without proof of the signature, appointment or authority of the director."

Purpose of the code of practice

The purpose of this code of practice is to provide practical guidance to ensure compliance with *The Occupational Health and Safety Act, 1993* and *The Occupational Health and Safety Regulations, 1996* in relation to video display terminals (VDTs). It is intended to help prevent and reduce the severity of injuries and adverse health conditions that occur in the workplace as a consequence of the use of VDTs.

Application of the code of practice

This code of practice is limited to the provision of guidance with respect to the requirements of *The Occupational Health and Safety Act, 1993* and *The Occupational Health and Safety Regulations, 1996*. This code of practice does not deal with nor ensure compliance with the additional requirements imposed on VDTs and their use by *The Radiation Health and Safety Act, 1985* and *The Radiation Health and Safety Regulations*. The requirements of this legislation are discussed in Appendix B.

Effect of compliance with the code of practice

Compliance with this code of practice is evidence of compliance with *The Occupational Health and Safety Act, 1993* and *The Occupational Health and Safety Regulations, 1996*. Failure to comply with the provisions of this code of practice is not in and of itself an offence, but such failure may be evidence of non-compliance with *The Occupational Health and Safety Act, 1993* or its regulations.

Application of the Act and regulations to VDTs

Many sections of *The Occupational Health and Safety Act, 1993* and its regulations are applicable to VDTs and their use. The Act and regulations do not, however, define or make specific reference to VDTs.

The sections of the Act that are applicable to VDTs include section 3, that states in part:

Codes of practice

"**3** Every employer shall:

(a) ensure, insofar as is reasonably practicable, the health, safety and welfare at work of all the employer's workers; ...

(e) comply with this Act and the regulations."

and section 9 which states in part:

> "**9**(2) ...an employer shall provide all required information to the following at a place of employment:
>
> (a) the occupational health committee;
>
> (b) the occupational health and safety representative; or
>
> (c) the workers, where there is no occupational health committee and no occupational health and safety representative."

The sections of the regulations that are applicable to VDTs include the general duties of employers contained in section 12 that state in part:

> "**12** The duties of an employer at a place of employment include:
>
> (a) the provision and maintenance of plant, systems of work and working environments that ensure, as far as is reasonably practicable, the health, safety and welfare at work of the employer's workers;
>
> (b) arrangements for the use, handling...of articles...in a manner that protects the health and safety of workers;
>
> (c) the provision of any information, instruction, training and supervision that is necessary to protect the health and safety of workers at work; ..."

The following sections of the regulations also apply to VDTs:

13 general duties of workers

19 training of workers

65 ventilation and air supply

69 lighting

70 thermal conditions

79 standing

80 sitting

81 musculoskeletal injuries

82 constant effort and exertion

83 visually demanding tasks

109 noise control

The relevant text in these sections is found in Appendix A.

Definitions

For the purpose of this code of practice:

"**Video Display Terminal**" or "**VDT**" shall mean equipment that includes a screen which displays computer or microprocessor generated information that is utilized by an operator as part of their work. Video display terminals include, but are not limited to:

- computer input or retrieval terminals for word processing or data viewing or manipulation;
- calculators with display screens; and,
- display units associated with ultrasound imaging, digital radiography, nuclear magnetic resonance, computer art, computer assisted design, process control systems, simulators and radar displays.

An "**operator**" in this code of practice means a worker who regularly is required to use a VDT during their normal duties for more than 10 hours per week or for more than four hours per day.

Code of practice

1 Work station design

An employer shall ensure, insofar as is reasonably practicable, that the VDT and associated work station is designed, constructed, maintained and operated in a manner that minimizes physical and visual demands on operators by meeting the standards listed below.

VDT screen

1. The VDT screen quality shall be adequate to ensure:
   i) good legibility of the image or characters;
   ii) uniformity of focus of the image or characters;
   iii) uniformity of the luminance of the screen;
   iv) adequacy of contrast between the characters and the background; and,
   iv) lack of annoying flicker and tremor.
2. The VDT capability allows operators to select the font size that is the most legible and comfortable.
3. Where applicable, the VDT screen design and construction shall be in accordance with the characteristics in Appendix C.

Monitor

4. The monitor shall be supported on a stable surface.
5. The angle of the monitor screen may be adjusted by the operators as desired.
6. The screen height can be adjusted by operators for the most comfort. The most comfortable eye position is looking downward at 20 to 50 degrees. Persons using bifocals usually need the screen height to be considerably lower than that of persons without bifocals.
7. The viewing distance to the screen may be varied by operators for the most comfort. A distance within a range of 30 to at least 70 centimetres (12 to 28 inches) may be needed for a standard 14" screen. For larger screens, greater distances are usually necessary.

Keyboard

8. The keyboard shall be located to allow operators to work in a comfortable position with their upper arms hanging comfortably at their sides and their forearms and wrists approximately parallel to the floor while keying.

Mouse, trackball or similar device

9. If provided, a mouse, trackball or similar device shall be easy to operate and comfortably fit in the hand.
10. If used, a mouse, trackball or similar device shall be located to allow operators to use it while working with their upper arms comfortably positioned at their sides and their forearms and wrists approximately parallel to the floor.
11. Where operators using a mouse, trackball or similar device are experiencing persistent health symptoms in their dominant hand, wrist, arm, elbow, shoulder or neck, a suitable arrangement shall be made to enable operators to use the device with their non-dominant hand or both hands.

Palm support (wrist rest) for keyboard

12. When there is extensive use of a keyboard or when adverse health conditions are noted in connection with keyboard use, a palm support (wrist rest) shall be made available for keyboard operators.
13. When a palm support is provided, the employer shall advise operators to:
    i) use it to support the palm, not the wrist; and,
    ii) use it only when pausing from keying, not while keying, in order to minimize the risk of nerve damage from continual pressure on the palm.

Forearm and palm support for mouse, trackball or calculator

14. There shall be methods of supporting operators' forearms and palms when they frequently use a mouse, trackball or other similar device or a calculator, or where the use of one of these devices causes or aggravates symptoms of adverse health conditions.

Leg room

15. There shall be adequate leg room at the VDT work station.

Workspace, document holder

16. A suitable document holder shall be provided where needed or upon the request of the operator.

Footrest

17. A footrest shall be provided when requested by the operator.

Working at a VDT while standing

18. Where a substantial part of the VDT work is done while standing, there shall be provided, when requested by the operator, either a footrest of approximately 15 to 20 cm (6 to 8 inches) in height or an anti-fatigue mat.

Telephone headsets

19. There shall be provided, when requested, a telephone headset for operators who have to spend substantial parts of their day talking on the telephone while using a VDT.

Work surface area

20. The desk top or other work surface shall have sufficient room for equipment and materials used by operators.

Work surface height

21. Where the desk top or other work surface on which the VDT is located is to be used for writing purposes, there shall be a writing surface height approximately equal to the height of the operators' elbows when seated comfortably.

Chair

22. Where a chair is provided, the chair shall permit operators to maintain a comfortable position while working, either by providing a chair that has, or is capable of being adjusted by the operators to have, the following characteristics:

    i) a good back support, particularly to the lower lumbar area;

    ii) a rounded front on the seat or one that does not cause pressure points on the underside of the operators' legs;

    iii) a seat height and angle that allows the operators' feet to rest comfortably on the floor or on a footrest while performing their job duties;

    iv) a non-slippery seat and, unless inappropriate, a seat that is covered with a breathable fabric;

v) a stable base;

vi) coasters appropriate for the floor surface; and,

vii) unless not desired by the operator, arm rests which do not interfere with placing the chair in a comfortable work position.

II Work environments

The employer shall take reasonably practicable measures to reduce the discomfort associated with the visual, auditory and thermal environments. Where reasonably practicable, these measures include the following provisions.

Illumination

1. An employer shall provide effective measures for reducing the visual demands of tasks. These measures may include:

   i) providing lighting at a level suitable for the operators' jobs (A lighting level of 20 to 50 decalux is often recommended for VDT workstations);

   ii) using dimmer controls for room or work station lighting;

   iii) providing separate, low wattage or shielded task lighting to illuminate documents when appropriate; and,

   iv) using recessed, indirect or baffled lighting.

Glare reduction

2. An employer shall take all effective means to control glare or reflections that cause discomfort to VDT operators. These means may include:

   i) reducing the lighting level in the work area;

   ii) providing curtains or blinds for windows or skylights adjacent to the work station;

   iii) shielding, screening or positioning of light sources;

   iv) positioning VDTs and operators with respect to sources of natural and artificial light in a manner that minimizes reflections on the screen;

   v) providing screen hoods to block angular reflections and glare sources;

   vi) using furnishings with a matte, non-reflective finish;

   vii) painting walls in a matte, non-reflective coating; and,

   viii) as a last resort, providing an appropriate anti-glare screen for the monitor.

Thermal environment

3. An employer shall maintain thermal conditions which are reasonable and appropriate to the nature of VDT work by such measures as:

   i) positioning operators at an appropriate distance from heating and cooling vents;

   ii) ensuring that the vents have ducts or are shielded where appropriate to prevent excessive airflow onto operators; and,

   iii) providing means to remove excessive heat generated by the VDT and associated equipment.

Noise

4. An employer shall ensure that all reasonably practicable means are used to reduce excessive or annoying noise caused by a VDT or equipment associated with the VDT. These means may include:

   i) providing and installing acoustic pads under keyboards and printers;

   ii) providing and installing acoustic covers on impact printers to reduce the sound level from the printer to not more than 65 dBA as measured at the work station; and,

   iii) providing and installing sound-absorbing panels in the work area.

III Training

An employer shall provide training to VDT operators.

1. The employer shall ensure that all VDT operators are fully informed on:

   i) the content of this code of practice;

   ii) the employer's procedures concerning VDTs;

   iii) factors which may lead to muscular, skeletal or visual distress;

Early warning symptoms

   iv) the recognition of early warning signs for musculoskeletal injuries which may occur during or after work, particularly at night, among VDT operators including numbness, pain, tingling, swelling, burning sensations or weakness in their hand, wrist, elbow, arm, neck, shoulder or back;

Proper use of equipment

   v) the need to avoid using a keyboard or mouse with a bent wrist and to avoid resting their wrist or palm on the edges of desks or keyboard trays;

vi) the need to avoid resting their elbows on hard chair arms or other hard surfaces for long periods of time, in order to avoid nerve compression;

vii) the need to remove their hands from the keyboard, mouse, trackball, or other devices, and place them in their lap for a few seconds from time to time each hour;

Proper use of work station

viii) the proper use and adjustment, where appropriate, of chairs and other items provided at the work station;

Other means of reducing physical and visual stress

ix) the desirability to make slight adjustments to posture, chair seat height and chair backrest positions periodically throughout the day;

x) the need to vary work activities throughout the day as much as possible;

xi) the need to blink throughout the day and to focus on objects three or more metres (10 feet) from the VDT screen for a few seconds from time to time every hour; and,

xii) simple exercises designed to minimize the development of health problems from regular operation of a VDT.

2. The employer shall also ensure that all training of workers described in this code:

i) is developed in consultation with the Occupational Health Committee, the Occupational Health and Safety Representative or the workers;

ii) is provided to workers when they commence working as a VDT operator unless they have already received the appropriate training elsewhere within the last three years; and,

iii) includes periodic refresher training for operators.

IV Work load

The work performed by VDT operators can demand constant and uninterrupted concentration on a screen or constant repetitive motions. Where this is the case, an employer shall take the action described below.

1. Allow operators five minutes of non-similar work after each hour of work using a VDT and 15 minutes of non-similar work after every two hours of work using a VDT. Regular rest breaks such as coffee breaks and lunch breaks are to be considered breaks from VDT work.

2. Encourage operators to take several "micro" breaks (20 to 30 seconds) from VDT work each hour throughout the day.

3. Where reasonably practicable, allow operators to control the pace of their VDT work.

4. As much as is reasonably practicable, include non-VDT tasks in the job duties of VDT operators.

V Physical limitations

The employer shall take reasonably practicable measures to ensure the health, safety and welfare at work of workers who have physical limitations. These measures shall include the items described below.

Eye examinations

1. Without prejudice to the generality of section 83(2) of the regulations, an employer shall:

   i) advise all persons who use prescription glasses or contact lenses to consult an optometrist to verify whether their glasses or contact lenses are appropriate before they commence work as an operator;

   ii) advise operators to consult a physician or an optometrist if they experience recurring visual problems; and,

   iii) encourage operators over 45 years in age to obtain professional ophthalmic advice every two years.

2. Where a worker cannot attend a consultation mentioned in clause 1(i) or 1(ii) during the worker's time off work, the employer shall permit the worker to attend the consultation during normal working hours without loss of pay or benefits.

3. Where a worker cannot recover the costs of a consultation mentioned in 1(i) or 1(ii), the employer shall reimburse the worker for the costs of the consultation that, in the opinion of the director, are reasonable when compared to typical fees being charged by health professionals in the province. The reimbursement is limited to the cost of the consultation only. It does not include the cost of routine eye examinations, prescription glasses or contact lenses.

Pregnant operators

4. An employer shall establish a policy for pregnant operators in consultation with the Occupational Health Committee or Occupational Health and Safety Representative, where either is required at a workplace.

5. As far as is reasonably practicable, an employer shall, upon request from a pregnant operator, provide temporary re-assignment to non-VDT work, if available.

6. If alternate work is not available or possible, the employer shall grant the pregnant operator, who so desires, a definite leave of absence without pay and without loss of seniority for all or part of the remaining term of her pregnancy.

Epileptics

7. Where an employer is aware that an operator may be epileptic, the employer shall alert the operator to the possibility that exposure to VDTs may trigger an epileptic seizure and advise the operator to consult a physician.

VI Procedures

An employer shall develop a procedure to help deal with VDT-related injury.

1. The procedure shall set out how operators may report any VDT-related symptoms.

2. The procedure shall encourage VDT operators who experience symptoms to keep a log or journal of their symptoms that may be caused by their use of VDTs.

3. The procedure shall set out how an employer is to follow up on VDT-related symptoms reported by an operator. The followup shall include:

   i) having a competent person evaluate and make recommendations to improve the operator's work station;

   ii) providing training to the operator, if appropriate; and,

   iii) encouraging the operator to see a physician as soon as possible if the symptoms persist.

4. The procedure shall address the measures to be taken to protect operators who have been diagnosed by a physician as having a VDT-associated injury from further VDT injury.

Appendix A

The Occupational Health and Safety Regulations, 1996 which pertain to VDTs and VDT operators

General duties of employers

12 The duties of an employer at a place of employment include:

(a) the provision and maintenance of plant, systems of work and working environments that ensure, as far as is reasonably practicable, the health, safety and welfare at work of the employer's workers;

(b) arrangements for the use, handling, storage and transport of articles and substances in a manner that protects the health and safety of workers;

(c) the provision of any information, instruction, training and supervision that is necessary to protect the health and safety of workers at work; and

(d) the provision and maintenance of a safe means of entrance to and exit from the place of employment and all worksites and work-related areas in or on the place of employment.

4 Oct 96 cO-1.1 Reg 1 s12.

General duties of workers

13 A worker shall:

(a) use the safeguards, safety appliances and personal protective equipment provided in accordance with these regulations and any other regulations made pursuant to the Act; and

(b) follow the safe work practices and procedures required by or developed pursuant to these regulations and any other regulations made pursuant to the Act.

4 Oct 96 cO-1.1 Reg 1 s13.

Training of workers

19(1) An employer shall ensure that a worker is trained in all matters that are necessary to protect the health and safety of the worker when the worker:

(a) begins work at a place of employment; or

(b) is moved from one work activity or worksite to another that differs with respect to hazards, facilities or procedures.

(2) The training required by subsection (1) must include:

(a) procedures to be taken in the event of a fire or other emergency;

(b) the location of first aid facilities;

(c) identification of prohibited or restricted areas;

(d) precautions to be taken for the protection of the worker from physical, chemical or biological hazards;

(e) any procedures, plans, policies and programs that the employer is required to develop pursuant to the Act or any regulations made pursuant to the Act that apply to the worker's work at the place of employment; and

(f) any other matters that are necessary to ensure the health and safety of the worker while the worker is at work.

(3) An employer shall ensure that the time spent by a worker in the training required by subsection (1) is credited to the worker as time at work, and that the worker does not lose pay or other benefits with respect to that time.

(4) An employer shall ensure that no worker is permitted to perform work unless the worker:

(a) has been trained, and has sufficient experience, to perform the work safely and in compliance with the Act and the regulations; or

(b) is under close and competent supervision.

4 Oct 96 cO-1.1 Reg 1 s19.

Ventilation and air supply

65 An employer, contractor or owner shall:

(a) ensure the adequate ventilation of a place of employment; and

(b) to the extent that is reasonably practicable, render harmless and inoffensive, and prevent the accumulation of, any contaminants or impurities in the air by providing an adequate supply of clean and wholesome air and maintaining its circulation throughout the place of employment.

4 Oct 96 cO-1.1 Reg 1 s65.

Lighting

69(1) While workers are present at a worksite, an employer, contractor or owner shall provide lighting that is sufficient to protect the health and safety of workers and suitable for the work to be done at the worksite.

(2) An employer, contractor or owner shall ensure that the illumination of all parts of a place of employment where workers pass, other than underground at a mine, is at least five decalux.

(3) Where failure of the regular lighting system is likely to create conditions dangerous to the health or safety of workers, an employer, contractor or owner shall provide appropriate emergency lighting of at least five decalux for the worksite and exit routes from the worksite.

(4) An employer, contractor or owner shall ensure that:

(a) light fixtures, windows and skylights that provide light for work are, where practicable, kept clean and free from any obstruction, except for special treatment of light fixtures, windows or skylights to reduce heat or glare; and

(b) artificial light sources and reflective surfaces are positioned, screened or provided with a shade, where practicable, to prevent glare or the formation of shadows that cause discomfort or a risk of accident to a worker.

4 Oct 96 cO-1.1 Reg 1 s69.

Thermal conditions

70(1) Subject to subsection (3), in an indoor place of employment, an employer, contractor or owner shall provide and maintain thermal conditions, including air temperature, radiant temperature, humidity and air movement, that:

(a) are appropriate to the nature of the work performed;

(b) provide effective protection for the health and safety of workers; and

(c) provide reasonable thermal comfort for workers.

Standing

79(1) Where workers are required to stand for long periods in the course of their work, an employer or contractor shall provide adequate anti-fatigue mats, footrests or other suitable devices to give relief to workers.

4 Oct 96 cO-1.1 Reg 1 s79.

Sitting

80(1) Where, in the course of their work, workers have reasonable opportunities for sitting without substantial detriment to their work, an employer or contractor shall provide and maintain for their use appropriate seating to enable the workers to sit.

(2) Where a substantial portion of any work can properly be done sitting, an employer or contractor shall provide and maintain:

(a) a seat that is suitably designed, constructed, dimensioned and supported for the worker to do the work; and

(b) where needed, a footrest that can readily and comfortably support the worker's feet.

4 Oct 96 cO-1.1 Reg 1 s80.

Musculoskeletal injuries

81(1) In this section, **"musculoskeletal injury"** means an injury or disorder of the muscles, tendons, ligaments, nerves, joints, bones or supporting vasculature that may be caused or aggravated by any of the following:

(a) repetitive motions;

(b) forceful exertions;

(c) vibration;

(d) mechanical compression;

(e) sustained or awkward postures;

(f) limitations on motion or action;

(g) other ergonomic stressors.

(2) An employer or contractor, in consultation with the committee, shall regularly review the activities at the place of employment that may cause or aggravate musculoskeletal injuries.

(3) Where a risk of musculoskeletal injury is identified, an employer or contractor shall:

(a) inform each worker who may be at risk of developing musculoskeletal injury of that risk and of the signs and common symptoms of any musculoskeletal injury associated with that worker's work; and

(b) provide effective protection for each worker who may be at risk, which may include any of the following:

(i) providing equipment that is designed, constructed, positioned and maintained to reduce the harmful effects of an activity;

(ii) implementing appropriate work practices and procedures to reduce the harmful effects of an activity;

(iii) implementing work schedules that incorporate rest and recovery periods, changes in workload or other arrangements for alternating work to reduce the harmful effects of an activity.

(4) An employer or contractor shall ensure that workers who may be at risk of developing musculoskeletal injury are instructed in the safe performance of the worker's work, including the use of appropriate work practices and procedures, equipment and personal protective equipment.

(5) Where a worker has symptoms of musculoskeletal injury, an employer or contractor shall:

(a) advise the worker to consult a physician or a health care professional who is registered or licensed pursuant to an Act to practise any of the healing arts; and

(b) promptly review the activities of that worker and of other workers doing similar tasks to identify any cause of the symptoms and to take corrective measures to avoid further injuries.

4 Oct 96 cO-1.1 Reg 1 s81.

Shift work and constant effort and exertion

82 Where a worker works shifts or a worker's work demands constant and uninterrupted mental effort or constant and uninterrupted physical exertion, an employer or contractor, in consultation with the committee, shall:

(a) assess the risks to the worker's health and safety of the worker's work; and

(b) inform the worker of the nature and extent of the risks mentioned in clause (a) and the ways to eliminate or reduce those risks.

4 Oct 96 cO-1.1 Reg 1 s82.

Visually demanding tasks

83(1) An employer or contractor, in consultation with the committee, shall identify any tasks that involve a potentially harmful visual demand on a worker.

(2) An employer or contractor:

(a) shall take all practicable steps to reduce the harmful visual demand of those tasks;

(b) shall inform the worker of the risk of performing those tasks;

(c) shall advise the worker to consult a physician or an optometrist if any persistent vision impairment, disability or visual strain results from performing the tasks;

(d) where a worker cannot attend a consultation mentioned in clause (c) during the worker's time off work, shall permit the worker to attend the consultation during normal working hours without loss of pay or other benefits; and

(e) where a worker cannot recover the costs of a consultation mentioned in clause (c), shall reimburse the worker for the costs of the consultation that, in the opinion of the director, are reasonable.

4 Oct 96 cO-1.1 Reg 1 s83.

General duty

109(1) An employer, contractor or owner shall ensure that all reasonably practicable means are used to reduce noise levels in all areas where workers may be required or permitted to work.

(2) The means to reduce noise levels pursuant to subsection (1) may include any of the following:

(a) eliminating or modifying the noise source;

(b) substituting quieter equipment or processes;

(c) enclosing the noise source;

(d) installing acoustical barriers or sound-absorbing materials.

4 Oct 96 cO-1.1 Reg 1 s109.

Appendix B

Radiation emissions from video display terminals

Almost the entire electromagnetic spectrum, including very low-energy x-rays, is included in the radiation produced by video display terminals. The optical radiation emitted includes ultraviolet (UV), visible, and infrared (IR) radiation. Visible light forms the image that the VDT is intended to produce. IR appears as heat emitted by the unit. Amounts of UV emitted from the tube are much less than that coming through the window on a winter's day. Electric and magnetic fields are emitted by the horizontal deflection coils and from the power supply, transformers and vertical deflection coils. These fields are predominantly in the very low frequency (VLF) range of 15-35 kHz and the extremely low frequency (ELF) range of 60 Hz.

In the past, VDTs have been extensively monitored for x-ray emissions. In Saskatchewan, as well as other Canadian jurisdictions, there have been no reports of measurable levels of x-rays coming from video display terminals. This is because, although x-rays are produced inside the cathode ray tube, the glass screen is thick enough to completely absorb them before they escape. As there are no x-rays being emitted, the Occupational Health and Safety Division strongly **discourages** the use, by VDT operators, of lead aprons. In fact, due to their extreme weight, lead aprons can be a health hazard when worn by a pregnant VDT operator.

For VDTs, the main concern today appears to be the electric and magnetic field (EMF) emissions. It is well documented that electric and magnetic fields in the VLF and ELF ranges are readily detected near all video display terminals. The electric and magnetic fields measured at the operator's position from VDTs in Saskatchewan are summarized in Table 1. The levels are well below those that might be considered hazardous for both the pregnant and the non-pregnant worker (see Table 2). The majority of published material supports this position. It must be noted that VDTs are not unique in emitting electromagnetic fields. All electrical appliances emit this type of radiation.

Table 1: Electric and Magnetic Field Readings from VDTs in Saskatchewan
Measurements at operator position (50 cm)

	Electric Field Range (V/m)	Average (V/m)	Magnetic Field Range (mA/m)	Average (mA/m)
VLF Range	0.27 – 2.76	1.03 (59)*	0.14 – 40.5	10.7 (59)
ELF Range	0.5 – 19.9	5.7 (7)	11 - 400	118 (14)

** number in brackets indicates number of monitors tested*

Regulations under *The Radiation Health and Safety Act, 1985* prescribe dose limits and exposure limits for most types of radiation. Exposure limits for radio frequency fields, including the VLF range, are prescribed in section 51. The exposure limits for the VLF frequency range, 10 kHz to 30 kHz, are 60 V/m for the electric field and 490 mA/m for the magnetic field. Saskatchewan, like other provincial, federal and international jurisdictions, does not have regulations covering the 50/60 Hz ELF range. For the ELF range, Saskatchewan uses the guidelines recommended by the International Commission on Non-Ionizing Radiological Protection (ICNIRP). The ICNIRP guidelines are shown in Table 2.

The electric and magnetic fields from VDTs are sometimes higher at the back of a terminal than at the front. As it is good practice to avoid unnecessary exposure to non-ionizing radiation from adjacent VDTs, it is recommended that any adjacent terminals be at least 100 cm (40 inches) from any worker's upper body.

In addition to regulations and international guidelines, the Swedish industry developed some standards for the manufacturing of VDTs. These standards, known as the Swedish MPR II Safety Standards, although not law, are adhered to by most manufacturers. The Swedish MPR II Safety Standards list maximum electric and magnetic field emissions at the normal working distance (approximately 50 cm) from the terminal.

Table 2: Emission Limits for Electric and Magnetic Fields

Regulation or Guideline	Frequency Range	Electric Field Limit	Magnetic Field Limit*
The Radiation Health and Safety Regulations, Saskatchewan, (Public)	VLF	60 V/m	490 mA/m
	ELF	n/a	n/a
International Commission on Non-Ionizing Radiological Protection (ICNIRP) Recommendations (Public)	VLF	87 V/m	5,000 mA/m
	ELF	4,170 V/m	67,000 mA/m
Swedish MPR II Standards (VDT Manufacturing Standards) (measurements taken at 50 cm)	VLF	2.5 V/m	20 mA/m
	ELF	25 V/m	200 mA/m

** Equipment for measuring the magnetic field, in addition to the milliampere, sometimes use the units of gauss or tesla. The conversion factors for these units are 1,000 mA/m = 12.5 milligauss (mG) = 1.25 microtesla (μT).*

Appendix C

Desirable characteristics of a video display terminal

Resolution

The density of the dot matrix for the alpha-numeric characters should not be less than seven dot rows and nine dot columns. The distance between the lines should be such that characters from one line do not become mixed up with characters on the line below. The character design should enable ease of distinguishing between the similar alpha-numeric characters (e.g.: C and G; I ,1 and I; D, 0 and O; B and 8; etc.). A screen size of at least 14" is desirable for intensive visual use.

Display effect

Notwithstanding its interaction with other display parameters, refresh rate is an important determinant of flicker perception. A rate of 60 Hertz (cycles per second) is recommended for negative contrast displays (light characters on a dark background) and a rate of 100 Hertz is recommended for positive contrast displays (dark characters on a light background.)

Font size

The size of text being used should be readable at three times the normal viewing distance. In general, font sizes for characters on VDT screens should not be less than 11 point, unless the characters are only viewed for short periods of time. The best option is to allow operators to choose the font size which is the most comfortable for their eyes, even if it means having to do a substantial amount of scrolling to view the document.

Colour

Colours for regular, prolonged use units should not be at the blue or red ends of the spectrum since these make the image less distinct. Dark characters on a light background are best if reflections are a problem. Black characters on a white or light grey background is recommended if VDT operators are experiencing sore eyes.

Luminance and contrast

The display screen should be equipped with user controls for both image luminance (brightness) and contrast. The luminance of the character or its background, whichever is brighter, should be between 35 and 45 candela per square meter. Under acceptable conditions, the contrast ratio between the characters and the background should be approximately 3.5:1.

SAFETY

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